**3GPP TSG RAN WG1 Meeting #101-e                     R1-200xxxx**

**e-Meeting, May 25 – June 5, 2020**

**Agenda Item: 7.2.2.2.2**

**Source: Charter Communications**

**Title: Draft [101-e-NR-unlic-NRU-InitAccessProc-01]**

**Document for: Discussion and Decision**

# Introduction

Four email discussions have been sanctioned in RAN1#101-e on initial access procedures for NR-U based on contributions submitted to this meeting [1]-[13]. This first discussion that aims to converge by 5/29 has the following scope:

[101-e-NR-unlic-NRU-InitAccessProc-01] Email discussion/approval on the following issues from R1-2003306 until 5/29; if necessary endorse associated TPs by 6/4 – Amitav (Charter)

* (#2.1, #2.3, #2.4, #2.5) Remaining corrections for cell search in TS 38.213.
* (#2.2, #2.6) Clarifications on PDSCH rate-matching around a given SSB index.

These issues have been selected based on the preparatory discussion summarized in [14].

# Company views

## Remaining corrections for cell search

### (#2.1)

**Description**: Replace the parameter “ssbPositionQCL-Relationship-r16” with “ssb-PositionQCL-r16” for signaling of Q in Clause 4.1 of TS 38.213 to align with TS 38.331 [2].

------------------------------------- < Start of TP#1 for Clause 4.1 of 38.213 > ------------------------------------------

4 Synchronization procedures

4.1 Cell search

< Unchanged parts are omitted >

For operation with shared spectrum channel access, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, QCL-TypeA, and QCL-TypeD properties, when applicable [6, TS 38.214], if a value of is same among the SS/PBCH blocks. is an index of a DM-RS sequence transmitted in a PBCH of a corresponding SS/PBCH block, and is either provided by *~~ssbPositionQCL-Relationship-r16~~ssb-PositionQCL-r16* or, if *~~ssbPositionQCL-Relationship-r16~~ssb-PositionQCL-r16* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-1 with [4, TS 38.211]. *subCarrierSpacingCommon* indicates SCS of RMSI only for the case of "operation without shared spectrum channel access". The UE can determine an SS/PBCH block index according to , or according to where is the candidate SS/PBCH block index. The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.

Table 4.1-1: Mapping between the combination of subCarrierSpacingCommon and LSB of ssb-SubcarrierOffset to

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| *subCarrierSpacingCommon* | LSB of *ssb-SubcarrierOffset* |  |
| scs15or60 | 0 | 1 |
| scs15or60 | 1 | 2 |
| scs30or120 | 0 | 4 |
| scs30or120 | 1 | 8 |

Upon detection of a SS/PBCH block, the UE determines from *MIB* that a CORESET for Type0-PDCCH CSS set, as described in Clause 13, is present if  [4, TS 38.211] for FR1 or if  for FR2. The UE determines from *MIB* that a CORESET for Type0-PDCCH CSS set is not present if  for FR1 or if  for FR2; the CORESET for Type0-PDCCH CSS set may be provided by *PDCCH-ConfigCommon*.

< Unchanged parts are omitted >

-------------------------------------------------- < End of TP#1> -----------------------------------------------------

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| **Company** | **Views** |
| Samsung | OK with TP#1. |
| Sharp | OK with TP#1. |
| Vivo | OK with TP#1 |
| LG Electronics | Support |
| Spreadtrum | Support |
| ZTE | Support |
| ETRI | Support |
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### (#2.3)

**Description**: Modify the description in Clause 4.1 of TS 38.213 (If MSB , , of *ssb-PositionsInBurst* is set to 1, the UE assumes that one or more SS/PBCH blocks within the discovery burst transmission window with candidate SS/PBCH block indices corresponding to SS/PBCH block index equal to may be transmitted) to clarify only one transmitted SS/PBCH blocks with a same SS/PBCH block index within a discovery burst transmission window [2].

------------------------------------- < Start of TP#2 for Clause 4.1 of 38.213 > ------------------------------------------

4 Synchronization procedures

4.1 Cell search

< Unchanged parts are omitted >

For operation with shared spectrum channel access, a UE assumes that transmission of SS/PBCH blocks in a half frame is within a discovery burst transmission window that starts from the first symbol of the first slot in a half-frame. The UE can be provided per serving cell by *DiscoveryBurst-WindowLength-r16* a duration of the discovery burst transmission window. If *DiscoveryBurst-WindowLength-r16* is not provided, the UE assumes that the duration of the discovery burst transmission window is a half frame. For a serving cell, the UE assumes that a periodicity of the discovery burst transmission window is same as a periodicity of half frames for receptions of SS/PBCH blocks in the serving cell. The UE assumes that one or more SS/PBCH blocks indicated by *ssb-PositionsInBurst* may be transmitted within the discovery burst transmission window and have candidate SS/PBCH blocks indices corresponding to SS/PBCH block indices provided by *ssb-PositionsInBurst*. If MSB , , of *ssb-PositionsInBurst* is set to 1, the UE assumes that one SS/PBCH block among~~or more~~ SS/PBCH blocks within the discovery burst transmission window with candidate SS/PBCH block indices corresponding to SS/PBCH block index equal to may be transmitted; if MSB is set to 0, the UE assumes that the SS/PBCH block(s) are not transmitted.

< Unchanged parts are omitted >

-------------------------------------------------- < End of TP#2> -----------------------------------------------------

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| **Company** | **Views** |
| Samsung | OK with the proposal in general. For TP#2, suggest further change to “one SS/PBCH block among SS/PBCH block(s) within …”. Moreover, after the TP is agreed, a LS to RAN2 is needed to suggest a corresponding change in TS 38.331, since the description of ssb-PositionsInBurst directly quotes this sentence in TS 38.213. |
| Sharp | OK with the proposal. We agree with Samsung. |
| Vivo | Agree with Samsung |
| LG Electronics | Agree with Samsung |
| Spreadtrum | In our view, the sentence to be modified is used for PDSCH rate matching around SSB or collision handling, e.g. PDCCH vs. SSB. We are confused about UE behavior on SSB detection, PDSCH reception and PDCCH monitoring. The intention of modification is to let UE have to detect SSB before PDSCH reception or PDCCH monitoring in the DRS transmission window? We admit we support SSB based CSI-RS validation, and we think SSB based measurement may occur together with CSI-RS based measurement, and it is friendly for UE implementation. But for PDSCH reception or PDCCH monitoring, we suspect SSB detection based mechanism. For CSI-RS validation, it can be a cancellation of measurement sample, but for PDSCH reception or PDCCH monitoring, there is no cancelation or the reception pipeline should be modified? For PDSCH rate matching, we think the semi-static or PDCCH-based dynamic rate matching seems enough. For PDCCH collision handling, we think the semi-static seems enough.  Could the proponent please clarify whether there is new UE behavior on PDSCH rate matching or PDCCH collision handling related to SSB? |
| ZTE | Support. The intention of TP#2 and TP#14 are both from the agreement we made in last meeting “a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.”. |
| ETRI | Agree with Samsung |
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### (#2.4) Editorial corrections

**Description**:

* Correct indexing references or add ‘candidate SS/PBCH block index’ terminology in:
  + TS 38.214 Subclause 5.1.4 relating to PDSCH rate matching [8].
  + TS 38.213 Subclause 8.1 relating to RO validation [9].
  + TS 38.213 Subclause 11.1.1 relating to UL validation in SFI [9].
  + TS 38.213 Subclause 9.2.3 relating to PUCCH repetition [9].
  + TS 38.213 Subclause 5 relating to RLM [7].
  + TS 38.213 Subclause 8.1 relating to association between SS/PBCH blocks and PRACH occasions [6].
  + TS 38.213 Subclause 7 relating to path loss reference [6].

==================== Start of TP#3 for Clause 5.1.4 of TS 38.214 =======================

\*\*\* Unchanged text is omitted \*\*\*

5.1.4 PDSCH resource mapping

When receiving the PDSCH scheduled with SI-RNTI and the system information indicator in DCI is set to 0, the UE shall assume that no SS/PBCH block is transmitted in REs used by the UE for a reception of the PDSCH.

When receiving the PDSCH scheduled with SI-RNTI and the system information indicator in DCI is set to 1, RA-RNTI, MsgB-RNTI, P-RNTI or TC-RNTI, the UE assumes SS/PBCH block transmission according to *ssb-PositionsInBurst*, and if the PDSCH resource allocation overlaps with PRBs containing SS/PBCH block transmission resources the UE shall assume that the PRBs containing SS/PBCH block transmission resources are not available for PDSCH in the OFDM symbols where SS/PBCH block is transmitted.

A UE expects a configuration provided by *ssb-PositionsInBurst* in *ServingCellConfigCommon* to be same as a configuration provided by *ssb-PositionsInBurst* in *SIB1*.

When receiving PDSCH scheduled by PDCCH with CRC scrambled by C-RNTI, MCS-C-RNTI, CS-RNTI, or PDSCHs with SPS, the REs corresponding to the configured or dynamically indicated resources in Clauses 5.1.4.1, 5.1.4.2 are not available for PDSCH. Furthermore, the UE assumes SS/PBCH block transmission according to *ssb-PositionsInBurst* if the PDSCH resource allocation overlaps with PRBs containing SS/PBCH block transmission resources, the UE shall assume that the PRBs containing SS/PBCH block transmission resources are not available for PDSCH in the OFDM symbols where SS/PBCH block is transmitted.

A UE is not expected to handle the case where PDSCH DM-RS REs are overlapping, even partially, with any RE(s) not available for PDSCH*.*

For operation with shared spectrum channel access, SS/PBCH block transmission according to *ssb-PositionsInBurst* represents candidate SS/PBCH blocks corresponding to SS/PBCH block indices provided by *ssb-PositionsInBurst* as described in Clause 4.1 of [6, TS 38.213].

================================== End of TP#3 ============================

===================== Start of TP#4 for Clause 8.1 of TS 38.213 =======================

**8.1 Random access preamble**

------------------------------------------------------ Unchanged parts omitted ------------------------------------------------------

For unpaired spectrum,

- if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion in a PRACH slot is valid if it does not precede a SS/PBCH block in the PRACH slot and starts at least  symbols after a last SS/PBCH block reception symbol, where  is provided in Table 8.1-2.

- the SS/PBCH block is provided according to *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon*

- If a UE is provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion in a PRACH slot is valid if

- it is within UL symbols, or

- it does not precede a SS/PBCH block in the PRACH slot and starts at least  symbols after a last downlink symbol and at least  symbols after a last SS/PBCH block symbol, where  is provided in Table 8.1-2, and if *ChannelAccessType-r16* = *semistatic* is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where there shall not be any transmissions, as described in [15, TS 37.213]

- the SS/PBCH block is provided according to *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon*.

-------------------------------------------------------- End of TP#4 ------------------------------------------------------------------

----------------------------------------------- Start of TP#5 for Clause 11.1.1 in TS 38.213 -------------------------------------

**11.1.1 UE procedure for determining slot format**

------------------------------------------------------ Unchanged parts omitted ------------------------------------------------------

For a set of symbols of a slot corresponding to SS/PBCH blocks with candidate SS/PBCH block indices indicated to a UE by *ssb-PositionsInBurst* in *SIB1,* or by *ssb-PositionsInBurst* in *ServingCellConfigCommon*, the UE does not expect to detect a DCI format 2\_0 with an SFI-index field value indicating the set of symbols of the slotas uplink.

-------------------------------------------------------- End of TP#5 ------------------------------------------------------------------

----------------------------------------------- Start of TP#6 for Clause 9.2.3 in TS 38.213 -------------------------------------

**9.2.6 PUCCH repetition procedure**

------------------------------------------------------ Unchanged parts omitted ------------------------------------------------------

A SS/PBCH block symbol is a symbol of an SS/PBCH block with candidate SS/PBCH block index indicated to a UE by *ssb-PositionsInBurst* in *SIB1* or *ssb-PositionsInBurst* in *ServingCellConfigCommon*.

-------------------------------------------------------- End of TP#6 ------------------------------------------------------------------

===========================Start of TP#7 for Clause 5 in TS 38.213===========================

**5 Radio Link Monitoring**

================================ Unchanged Texts Omitted ==============================

For operation with shared spectrum channel access, when a UE is provided a SS/PBCH block index by *ssb-Index*, the UE is expected to perform radio link monitoring using SS/PBCH block(s) in the discovery burst transmission window as described in Clause 4.1, where the SS/PBCH block(s) have candidate SS/PBCH block index corresponding to SS/PBCH block index provided by *ssb-Index*.

================================ Unchanged Texts Omitted =============================

================================= End of TP#7 for TS 38.213 =============================

===========================Start of TP#8 for Clause 8.1 in TS 38.213========================

**8.1 Random access preamble**

\*\*\* Unchanged text omitted \*\*\*

Physical random access procedure is triggered upon request of a PRACH transmission by higher layers or by a PDCCH order. A configuration by higher layers for a PRACH transmission includes the following:

- A configuration for PRACH transmission [4, TS 38.211].

- A preamble index, a preamble SCS, , a corresponding RA-RNTI, and a PRACH resource.

A PRACH is transmitted using the selected PRACH format with transmission power ,as described in Clause 7.4, on the indicated PRACH resource.

For Type-1 random access procedure, a UE is provided a number  of SS/PBCH block~~s~~ indices associated with one PRACH occasion and a number  of contention based preambles per SS/PBCH block index per valid PRACH occasion by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB*.

For Type-2 random access procedure with common configuration of PRACH occasions with Type-1 random access procedure, a UE is provided a number of SS/PBCH block~~s~~ indices associated with one PRACH occasion by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB* and a number of contention based preambles per SS/PBCH block index per valid PRACH occasion by *msgA-CB-PreamblesPerSSB*. The PRACH transmission can be on a subset of PRACH occasions associated with a same SS/PBCH block index for a UE provided with a PRACH mask index by *msgA-ssb-sharedRO-MaskIndex* according to [11, TS 38.321].

For Type-2 random access procedure with separate configuration of PRACH occasions with Type-1 random access procedure, a UE is provided a number of SS/PBCH block~~s~~ indices associated with one PRACH occasion and a number of contention based preambles per SS/PBCH block index per valid PRACH occasion by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB-msgA* when provided; otherwise, by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB*.

For Type-1 random access procedure, or for Type-2 random access procedure with separate configuration of PRACH occasions from Type 1 random access procedure, if , one SS/PBCH block index is mapped to consecutive valid PRACH occasions and contention based preambles with consecutive indices associated with the SS/PBCH block index per valid PRACH occasion start from preamble index 0. If , contention based preambles with consecutive indices associated with SS/PBCH block index , , per valid PRACH occasion start from preamble index where is provided by *totalNumberOfRA-Preambles* for Type-1 random access procedure, or by *msgA-totalNumberOfRA-Preambles* for Type-2 random access procedure with separate configuration of PRACH occasions from a Type 1 random access procedure, and is an integer multiple of .

For Type-2 random access procedure with common configuration of PRACH occasions with Type-1 random access procedure, if , one SS/PBCH block index is mapped to consecutive valid PRACH occasions and contention based preambles with consecutive indices associated with the SS/PBCH block index per valid PRACH occasion start from preamble index . If , contention based preambles with consecutive indices associated with SS/PBCH block index , , per valid PRACH occasion start from preamble index , where is provided by *totalNumberOfRA-Preambles* for Type-1 random access procedure.

For link recovery, a UE is provided SS/PBCH block~~s~~ indices associated with one PRACH occasion by *ssb-perRACH-Occasion* in *BeamFailureRecoveryConfig*. For a dedicated RACH configuration provided by *RACH-ConfigDedicated*, if *cfra* is provided, a UE is provided SS/PBCH block~~s~~ indices associated with one PRACH occasion by *ssb-perRACH-Occasion* in *occasions*. If , one SS/PBCH block index is mapped to consecutive valid PRACH occasions. If , all consecutive SS/PBCH blocks indices are associated with one PRACH occasion.

SS/PBCH block indices provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* are mapped to valid PRACH occasions in the following order where the parameters are described in [4, TS 38.211].

- First, in increasing order of preamble indices within a single PRACH occasion

- Second, in increasing order of frequency resource indices for frequency multiplexed PRACH occasions

- Third, in increasing order of time resource indices for time multiplexed PRACH occasions within a PRACH slot

- Fourth, in increasing order of indices for PRACH slots

An association period, starting from frame 0, for mapping SS/PBCH block~~s~~ indices to PRACH occasions is the smallest value in the set determined by the PRACH configuration period according Table 8.1-1 such that  SS/PBCH block~~s~~ indices are mapped at least once to the PRACH occasions within the association period, where a UE obtains  from the value of *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon*. If after an integer number of SS/PBCH block~~s~~ indices to PRACH occasions mapping cycles within the association period there is a set of PRACH occasions or PRACH preambles that are not mapped to  SS/PBCH block~~s~~ indices, no SS/PBCH block~~s~~ indices are mapped to the set of PRACH occasions or PRACH preambles. An association pattern period includes one or more association periods and is determined so that a pattern between PRACH occasions and SS/PBCH block~~s~~ indices repeats at most every 160 msec. PRACH occasions not associated with SS/PBCH block~~s~~ indices after an integer number of association periods, if any, are not used for PRACH transmissions.

\*\*\* Unchanged text omitted \*\*\*

================================= End of TP#8 for TS 38.213 =============================

===========================Start of TP#9 for Clause 7.1.1 in TS 38.213========================

\*\*\* Unchanged text omitted \*\*\*

- If the UE is not provided *pathlossReferenceRSs* or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource obtained from ~~the~~ an SS/PBCH block with the same SS/PBCH block index as the one that the UE uses to obtain *MIB*

\*\*\* Unchanged text omitted \*\*\*

================================= End of TP#9 for TS 38.213 =============================

===========================Start of TP#10 for Clause 7.2.1 in TS 38.213======================

\*\*\* Unchanged text omitted \*\*\*

- If the UE is not provided *pathlossReferenceRSs* or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource obtained from ~~the~~ an SS/PBCH block with the same SS/PBCH block index as the one that the UE uses to obtain *MIB*

\*\*\* Unchanged text omitted \*\*\*

================================= End of TP#10 for TS 38.213 ============================

===========================Start of TP#11 for Clause 7.3.1 in TS 38.213======================

\*\*\* Unchanged text omitted \*\*\*

- If the UE is not provided *pathlossReferenceRS* or *SRS-PathlossReferenceRS*, or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource obtained from ~~the~~ an SS/PBCH block with the same SS/PBCH block index as the one that the UE uses to obtain *MIB*

\*\*\* Unchanged text omitted \*\*\*

================================= End of TP#11 for TS 38.213 ===========================

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| **Company** | **Views** |
| Samsung | TP#3, OK with this clarification.  TP#4, we can understand the intention, but the TP here seems not addressing the intention. Did see an essential difference with and without the TP. Is the intention trying to say “the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst*”?  TP#5 and TP#6, either no change to specification, or clarifying it as “SS/PBCH blocks with candidate SS/PBCH block indices corresponding to the SS/PBCH block indices indicated to the UE by *ssb-PositionsInBurst*”.  TP#7, our proposal. This clarification is essential since *ssb-Index* has not been clarified yet in any of RAN1/RAN2 specifications.  TP#8, OK with this clarification.  TP#9, TP#10, and TP#11, OK with these clarifications. |
| Sharp | TP#3: We don’t support the TP as the current spec. is clear enough. The UE rate matches around the resources for SS/PBCH blocks with candidate SS/PBCH block index corresponding to the SS/PBCH block index according to *ssb-PositionsInBurst*.  TP#4: Motivation for change is not clear.  TP#5: “Candidate” should be removed. Candidate SS/PBCH block index is not indicated by *ssb-PositionsInBurst*.  TP#6: “Candidate” should be removed. Candidate SS/PBCH block index is not indicated by *ssb-PositionsInBurst*.  TP#7: We support the proposal in principle. We prefer simpler text for it.  For operation with shared spectrum channel access, when a UE is provided a SS/PBCH block index by *ssb-Index*, the UE is expected to perform radio link monitoring using candidate SS/PBCH block(s) corresponding to the SS/PBCH block index(s) in the discovery burst transmission window as described in Clause 4.1.  TP#8: We support the TP.  TP#9#10#11: Motivation for change is not clear. |
| vivo | TP#3: OK with the clarification and support the TP.  TP#4,5,6: Agree with Samsung. Better to add the reference to clause 4.1 of TS 38.213, i.e.  TP#4: the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* as described in Clause 4.1 of [6, TS 38.213].  TP#5 and TP#6: SS/PBCH blocks with candidate SS/PBCH block indices corresponding to the SS/PBCH block indices indicated to the UE by *ssb-PositionsInBurst* as described in Clause 4.1 of [6, TS 38.213].  TP#7: Support the TP. One minor revision below:  where the SS/PBCH block(s) have candidate SS/PBCH block ind~~ex~~ices corresponding to SS/PBCH block index provided by *ssb-Index*.  TP#8, 9 ,10, 11: OK with the clarification |
| LG Electronics | TP#3: Support  TP#4: Not necessary  TP#5 and TP#6: The intention can be understood, can we modify such as “For a set of symbols of a slot corresponding to candidate SS/PBCH blocks with indices indicated to a UE by *ssb-PositionsInBurst* in *SIB1*”?  TP#7: Support with vivo’s modification  TP#8/9/10/11: Support |
| Spreadtrum | Basically agree with Samsung. For TP#4, for now we don’t have “the index of the SS/PBCH block”, so it is just for alignment as editorial. |
| ZTE | TP#3: Support  TP#4, TP#5 and TP#6: They could be use the same format of modification:  The SS/PBCH block is the candidate SS/PBCH block(s) corresponding to the SS/PBCH index provided by *ssb-PositionInBurst* in SIB1 or in *ServingCellConfigCommon*.  TP#7: Support.  TP#8, 9 ,10, 11: OK with the clarification |
| ETRI | TP#3: Support  TP#4, TP#5 and TP#6: Support with vivo’s modification  TP#7: Support with vivo’s modification  TP#8, 9 ,10, 11: Support |
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### (#2.5)

**Description**: Add “The maximum number of transmitted SS/PBCH blocks within a discovery burst transmission window is 8.” to TS 38.213 Clause 4.1 [4].

==================== Start of TP#12 for Clause 4.1 of TS 38.213 =======================

\*\*\* Unchanged text is omitted \*\*\*

The candidate SS/PBCH blocks in a half frame are indexed in an ascending order in time from 0 to , where is determined according to SS/PBCH block patterns for Cases A through E. is a maximum number of SS/PBCH block indices in a cell, and

- for operation without shared spectrum channel access,

- for operation with shared spectrum channel access, for and 15 kHz SCS of SS/PBCH blocks and for and 30 kHz SCS of SS/PBCH blocks. The maximum number of transmitted SS/PBCH blocks within a discovery burst transmission window is 8.

For , a UE determines the 2 LSB bits of a candidate SS/PBCH block index per half frame from a one-to-one mapping with an index of the DM-RS sequence transmitted in the PBCH as described in [4, TS 38.211].

\*\*\* Unchanged text is omitted \*\*\*

================================== End of TP#12 ============================

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| **Company** | **Views** |
| Samsung | Understand the intention. One suggested TP to be genetic to both licensed and unlicensed bands as follow (current TP seems leaving actually transmitted SSB open for licensed band).  is a maximum number of SS/PBCH block indices in a cell, and the maximum number of transmitted SS/PBCH blocks within a half frame is . |
| Sharp | We support the TP. |
| Vivo | Support the TP |
| LG Electronics | Support TP#12 |
| Spreadtrum | Does the sentence “ is a maximum number of SS/PBCH block indices in a cell” plus “for operation with shared spectrum channel access, ” cover the sentence to be added? |
| ZTE | Although we still don’t think it’s necessary but it could be acceptable, we support TP#12. |
| ETRI | We think it is not necessary. However, if needed, we prefer to Samsung’s proposal. |
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## (#2.2, #2.6) Clarifications on PDSCH rate matching around SSBs

**Proposal A:** UE performs rate-matching for all of SS/PBCH block candidate position indices (within configured DRS transmission window) QCLed with actually transmitted SS/PBCH block indices that are provided by *ssb-PositionsInBurst* in RMSI [10].

==================== Start of TP#13 for Clause 5.1.4 of TS 38.214 =======================

**5.1.4 PDSCH resource mapping**

When receiving the PDSCH scheduled with SI-RNTI and the system information indicator in DCI is set to 0, the UE shall assume that no SS/PBCH block is transmitted in REs used by the UE for a reception of the PDSCH.

When receiving the PDSCH scheduled with SI-RNTI and the system information indicator in DCI is set to 1, RA-RNTI, MsgB-RNTI, P-RNTI or TC-RNTI, the UE assumes SS/PBCH block transmission according to *ssb-PositionsInBurst*, and if the PDSCH resource allocation overlaps with PRBs containing SS/PBCH block transmission resources the UE shall assume that the PRBs containing SS/PBCH block transmission resources are not available for PDSCH in the OFDM symbols where SS/PBCH block is transmitted.

A UE expects a configuration provided by *ssb-PositionsInBurst* in *ServingCellConfigCommon* to be same as a configuration provided by *ssb-PositionsInBurst* in *SIB1*.

When receiving PDSCH scheduled by PDCCH with CRC scrambled by C-RNTI, MCS-C-RNTI, CS-RNTI, or PDSCHs with SPS, the REs corresponding to the configured or dynamically indicated resources in Clauses 5.1.4.1, 5.1.4.2 are not available for PDSCH. Furthermore, the UE assumes SS/PBCH block transmission according to *ssb-PositionsInBurst* if the PDSCH resource allocation overlaps with PRBs containing SS/PBCH block transmission resources, the UE shall assume that the PRBs containing SS/PBCH block transmission resources are not available for PDSCH in the OFDM symbols where SS/PBCH block is transmitted.

A UE is not expected to handle the case where PDSCH DM-RS REs are overlapping, even partially, with any RE(s) not available for PDSCH*.*

For operation with shared spectrum channel access, SS/PBCH block transmission according to *ssb-PositionsInBurst* represents all of the candidate SS/PBCH block indices according to SS/PBCH block indices provided by *ssb-PositionsInBurst* as described in [Section 4.1, TS 38.213].

================================== End of TP#13 ============================

**Proposal B:** The UE performs PDSCH rate-matching around the resources of candidate SS/PBCH blocks corresponding to a same SS/PBCH block index according to *ssb-PositionsInBurst*, until the UE has successfully detected one SS/PBCH block within a discovery burst transmission window [2].

---------------------------- < Start of TP#14 for Clause 5.1.4 of 38.214 > ------------------------------------------

**5.1.4 PDSCH resource mapping**

< Unchanged parts are omitted >

When receiving PDSCH scheduled by PDCCH with CRC scrambled by C-RNTI, MCS-C-RNTI, CS-RNTI, or PDSCHs with SPS, the REs corresponding to the configured or dynamically indicated resources in Clauses 5.1.4.1, 5.1.4.2 are not available for PDSCH. Furthermore, the UE assumes SS/PBCH block transmission according to *ssb-PositionsInBurst* if the PDSCH resource allocation overlaps with PRBs containing SS/PBCH block transmission resources, the UE shall assume that the PRBs containing SS/PBCH block transmission resources are not available for PDSCH in the OFDM symbols where SS/PBCH block is transmitted until the UE has detected one SS/PBCH block within a discovery burst transmission window.

A UE is not expected to handle the case where PDSCH DM-RS REs are overlapping, even partially, with any RE(s) not available for PDSCH*.*

-------------------------------------------------- < End of TP#14> -----------------------------------------------------

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| **Company** | **Views** |
| Samsung | TP#13 can be merged with TP#3.  TP#14 is not needed. As explained in the preparation phase, the detection of one SSB by a UE should not be the criteria for performing from the gNB side. The information for transmitted SSB should be cell-specific, and gNB cannot enforce a UE to receive a SSB first before decoding PDSCH. Even the UE can detect the SSB, the PDSCH may not be intended for the same UE. |
| Sharp | Proposal A: We don’t support the TP as the current spec. is clear enough. The UE rate matches around the resources for SS/PBCH blocks with candidate SS/PBCH block index corresponding to the SS/PBCH block index according to *ssb-PositionsInBurst*.  Proposal B: It’s not clear to us why we need to change the agreed behavior. It causes UE/gNB ambiguity on the understanding of the reserved resource. |
| vivo | TP#13 address the same thing as TP#3  TP#14 is not needed. It is clear that PDSCH rate matching around SSB should be in cell specific manner as clarified by TP#3 |
| LG Electronics | Agree with Samsung and vivo. TP#13 can be merged with TP#3.  For TP#14, we share the view with Samsung. UE cannot be enforced to detect SSB before PDSCH reception, and the instance where UE firstly detects a SSB may not be the same as that instance where gNB firstly transmits a SSB. |
| Spreadtrum | Basically agree with Samsung.  For TP#14, honestly, in our view, TP in (#2.3) has the similar intention as TP#14. In my memory, the sentence to be modified in TP in (#2.3) is used for new implication of *ssb-PositionsInBurst* including the usage of PDSCH rate matching or PDCCH collision handling on SSB. More general, the sentence to be modified in TP in (#2.3) is for what we mean about candidate SSB position when we are talking about *ssb-PositionsInBurst*. |
| ZTE | We suggest to adopt Proposal B.  In last meeting, we have the agreement “a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.”, that’s why we have TP#2 and TP#14, corresponding to SSB transmission and related rate matching. We don’t mean to enforce UE to detect SSB before PDSCH, actually we always define the UE behavior in spec, and gNB behavior will be restricted accordingly. The rate matching could be in cell specific manner even with TP#14. The agreement we made in last meeting does have large impact on PDSC rate matching, for example, if Q=2, in a 5ms DRS window with 30kHz SCS, the number of candidate SSBs is 20, when UE detects a SSB in position 0, UE will not monitor the remaining candidate SSB positions, however the resources in these positions are wasted, which results in unnecessary degradation on spectral efficiency. |
| ETRI | TP#13 addresses the same issue as TP#3.  Regarding TP#14, we think it is not necessary. It may cause unintended rate-matching behavior since actual transmitted SSB position(s) would be varied in every DRS transmission window due to LBT. |
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